BLM LIBRARY
88049171
ID88049171
QL
666
.L26
T875
1980

# A survey of the occurrence and abundance of the flat-tailed horned lizard (Phrynosoma mcallii) in California

Frederick B. Turner, James C. Rorabaugh,[1]
Eric C. Nelson[2] and Mark C. Jorgensen[3]

January 25, 1980

Laboratory of Nuclear Medicine and Radiation Biology
University of California, Los Angeles 90024

Contract YA-512-CT8-58

[1] Present address: Institute of Ecology, University of California, Davis 95616

[2] U. S. Fish and Wildlife Service, St. Paul, Minnesota 55101

[3] Anza-Borrego Desert State Park, Borrego Springs, California 92004

rely on counts of scats as well as lizards; ii) counts should be made between mid-April and the end of May; iii) assessments of lease areas based on inspection of a single section are less reliable than those involving 5 or more sections.

The present distribution of P. mcallii ranges from the Coachella Valley in Riverside County, south along both sides of the Salton Sea into Imperial County. The range extends westward into the Borrego Valley between the Santa Rosa and Vallecito Mountains. The large agricultural and urban area in the Imperial Valley separates populations of P. mcallii in western Imperial County from those east of the East Highline Canal. The most favorable habitats are generally areas of low relief with surface soils of fine packed sand, or pavement, overlain with loose, fine sand. The vegetation is usually a simple association of creosotebush and bur-sage. Although P. mcallii and P. platyrhinos occur together in some areas around the fringes of the former's range, the two species are generally well separated.

P. mcallii is not an endangered species. However, the original geographic range of this lizard has been diminished, and the species is not as abundant in certain parts of its range as it once was. Such changes have almost certainly been brought about by human activities. P. mcallii, like many other desert species, is not in immediate danger of extinction but stands in jeopardy because of continued alteration or destruction of its habitat. If the development of desert lands continues unabated we will be faced with an ever expanding roster of endangered species in southeastern California.

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

## Introduction

The flat-tailed horned lizard (Phrynosoma mcallii),[1] occurs in desert areas of southeastern California, southwestern Arizona, and adjoining portions of Sonora and Baja California Norte, Mexico. In 1976 the Office of Endangered Species of the U. S. Fish and Wildlife Service recommended that the status of this species be reviewed.

Assessment of the distribution and abundance of P. mcallii, clarification of important characteristics of its habitats, and development of sound conservation policies are important needs, because this species often coexists with sources of natural gas, oil, geothermal energy and minerals, or occurs in areas of value for agricultural or recreational uses.

In 1978 we made detailed appraisals of eight areas in Imperial and Riverside Counties, combining careful searches for horned lizards with detailed analyses of soils, vegetation, and ants. Horned lizards were well represented at only one of these localities--Plot 15 in the Yuma Basin about 25 km west of Calexico. Five of the other areas (on East Mesa) were either uninhabited or sparsely populated by horned lizards. Two areas (one in western Imperial County, the other in Riverside County) sustained populations of P. mcallii, but at apparently lower densities than that observed in the Yuma Basin. Further details regarding these plots were given in an earlier report (Turner, Medica and Hill 1978).

The abundance of P. mcallii, as inferred from observations of lizards and counts of their scats, was not correlated with the apparent abundance

[1] We follow the nomenclature recommended by Funk in his preparation for the Catalog of North American Amphibians and Reptiles

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225

of the harvester ants (Pogonomyrmex californicus, P. magnacantha, Veromessor pergandei) on which the lizards feed. Numbers of lizards observed were positively correlated with aggregate density and inversely correlated with diversity of annual plants, but these two relationships reflected a single fact, viz., the reduction of diversity in areas where abundance of annuals was increased by large numbers of one or a few species. In general, analyses of horned lizard abundance and habitat attributes were limited by the small number of sites involved and the poor representation of lizards at most of the localities examined.

Clearly, further pursuit of relationships between the abundance of P. mcallii and ecological attributes of occupied habitats will require an analysis of more and better populated sites. The need for this kind of information stimulated a survey of 458 sections within the geographical range of P. mcallii in California during the spring of 1979.

In the meantime, managers are regularly required to make decisions regarding various types of land use in the desert areas of southeastern California--decisions impinging on the potential well-being of P. mcallii and other sensitive species. Hence, we carried out two sorts of field experiments designed to test the relative efficacy of quick surveys of the presence and abundance of P. mcallii.

## Procedures

In February 1979, using USGS topographical maps (7-1/2 minute quadrangles), Mark Dimmitt evaluated portions of Imperial, Riverside, and San Diego Counties within the geographic range of Phrynosoma mcallii. The extent of this range was based on available distributional records and the mapped range as given by Stebbins (1954, 1966). Probable discontinuities within the geographic range were inferred from physiography, elevation, and degree of agricultural, urban and/or industrial development.

The next step was to develop, on a section by section basis, a prioritized list of potential areas for field inspections. Most sections in prospective geothermal areas and adjacent to existing and proposed gravel leases were included. Some areas were excluded because of problems of access, e.g., those lying within the Chocolate Mountains Bombing and Gunnery Range, and those in sand dune areas without roads. Sections with the highest priority (1) were those in an area with a marked aggregation of past records; priority 2 indicated a section where one or two P. mcallii had been observed or collected in the past. Priority 3 sections were those of probable interest, but from which no horned lizards had been recorded. Sections assigned priority 4 were either questionable habitat, not conveniently accessible, or assigned low priority to reduce the number of sections with higher priorities.

On April 18 a one-day orientation was conducted in and near El Centro. This was attended by Eric Nelson (BLM), Mark Dimmitt (BLM), James Rorabaugh (BLM), Karla Kramer (BLM), Mark Roddy, Scott Inman,

Margaret Asplund, Todd Esque, Russell Duncan, Philip Medica (UCLA) and Frederick Turner (UCLA). The morning was spent west of Calexico, in the vicinity of Plot 15. During this time we observed and captured three Phrynosoma mcallii and identified and examined the characteristic scats of this species. In the afternoon an operational plan was established, which depended on careful coordination by the BLM staff in El Centro. James Rorabaugh assumed this responsibility.

Each field worker was given a list of sections and a small-scale map showing the location of all 7-1/2 minute quadrangles in the three counties. Field workers inspected the USGS quadrangle maps and familiarized themselves with the designations of individual sections by number, township and range. While the master set of maps prepared by Dimmitt was maintained at all times in El Centro, a duplicate set was set up for use by field workers. A field worker could obtain, either by mail or by coming to El Centro, a quadrangle map, or a group of maps, relevant to the area he wished to work. These maps were available during the period of field work, after which they were returned to El Centro. Guidance as to available roads and the quality of roads was obtained from BLM personnel in El Centro.

The basic element of field work was the "section search." This was defined as a one-hour walk through the area in question. During this time the field worker maintained records of P. mcallii observed (including any dead ones), other lizards observed, numbers of horned lizard scats counted, and numbers of nests of black (Veromessor pergandei) and red harvester ants (Pogonomyrmex californicus, P. magnacantha) counted. The face of the record card maintained is

illustrated in Fig. 1. On the back of this card the observer recorded brief descriptions of vegetation, soil, weather, and made any other notes deemed of value. The observer also sketched a small square on the back of the card and indicated the approximate course of the one-hour tour. Plastic vials were given to each worker, with instructions to collect the first two or three horned lizard scats observed in each section. These vials were returned to Rorabaugh and stored in El Centro. We were unable to distinguish between scats of P. mcallii and P. platyrhinos, but most of the field work was conducted in areas unoccupied by P. platyrhinos. We emphasize that the purpose of the section searches was to locate areas well inhabited by P. mcallii. Such brief searches cannot identify all such areas, nor do the section data rank individual sections reliably. As will be seen, however, the procedures followed were certainly successful in discovering new locales of interest.

On April 20, Frederick Turner and Maurice Getty (Superintendent of Anza-Borrego Desert State Park) met with park rangers at Borrego Springs. The project was described and a number of rangers were interested in the work. Mark Jorgensen agreed to serve as coordinator of searches in the Park. Section cards and vials were left with Jorgensen to distribute among his co-workers. Turner also met with Eugene Stewart in Riverside in early April and outlined the plan of work in Riverside County.

All completed section cards were sent to Rorabaugh. Throughout the course of the field work, Rorabaugh maintained a master map in El Centro, on which progress was regularly recorded. This map served

as the basis for distributing effort over the entire range of P. mcallii, and as a ready illustration of areas where horned lizards, or large numbers of scats, had been observed. Field work began April 19 and continued until the end of July.

Between April 24-26, Nelson and Rorabaugh laid out forty 10 x 10 m quadrats in Section 18, Townsnip 17S, Range 12E in the Yuha Basin. These quadrats were regularly disposed in four groups of 10, each group occupying a quarter-section. The ten quadrats in each quarter-section were arranged in two north-south lines of five, the westernmost line 268 m from the west side of the quarter-section and the other line 268 m farther east. The five quadrats in each line were 132 m apart beginning 132 m from the north side of the quarter-section. All forty quadrats were delineated with stakes and string, and scats of P. mcallii were counted in each plot.

Between May 15 and 17, Mark Roddy, Russell Duncan, Todd Esque, Frederick Turner, Philip Medica, Jim Rorabaugh and Karla Kramer examined 12 sections (or portions of sections) in the Mt. Signal, Yuha Basin, Holtville NE, Glamis, Painted Gorge, Superstition Mountain and Plaster City 7-1/2 minute quadrangles. These sections contained either potential geothermal areas (Mt. Signal, Yuha Basin) or sand and gravel deposits. Each section was traversed by two people for two hours, and the same records maintained as in the course of a regular section search.

## Results

Counts of Phrynosoma mcallii and horned lizard scats in 458 sections in southeastern California during 1979 are given in Appendix 1. The sections are grouped in twelve general areas. These areas represent assemblages of 7-1/2 (or 15) minute quadrangles, grouped on grounds of geographic contiguousness and similarity of habitats. The quadrangles included in each group were as follows: 1: Gray's Well NE, Ogilby (15); 2: Glamis SE, Glamis SW, Gray's Well, Holtville E, Midway Well, Midway Well NW; 3: Acolita, Amos, Glamis, Glamis NW, Holtville NE; 4: Durmid, Frink, Frink NW, Iris; 5: Cathedral City, Desert Hot Springs, Indio, La Quinta, Lost Horse Mountain (15), Mortmar, Myoma, Oasis, Palm Springs, Seven Palms Valley; 6: Borrego Sink, Clark Lake (15); 7: Harper's Well, Kane Spring, Kane Spring NE, Kane Spring NW, Seventeen Palms; 8: Borrego Mountain, Harper Canyon, Shell Reef; 9: Plaster City NW, Superstition Mountain; 10: Painted Gorge, Plaster City; 11: Carrizo Mountain, Coyote Wells, In-Ko-Pah Gorge; 12: Mount Signal, Yuma Basin. Figs. 2-6 illustrate the locations of the sections examined and give a general indication of results of observations.

The 1979 effort in 12 areas is summarized in terms of time of season (Table 1) and time of day (Table 2). In Table 1, "mean time of season" for each area was calculated by assigning a value of 1 to the period April 15-28, a value of 2 to April 29-May 12, etc., and computing the weighted means. In Table 2, "mean time of day" was computed by assigning a value of 6 to the time interval 0500-0659, a value of 8 to the time interval 0700-0859, etc., and computing the weighted means. Table 2

gives observations of Phrynosoma mcallii and counts of scats of horned lizards counted in 12 areas. Table 4 gives observations of horned lizards and counts of scats according to time of season. Mean numbers of P. mcallii counted per man-hour in 11 areas (Area 6 was omitted) were taken as dependent variables, and mean time of season (Table 1) and mean time of day (Table 2) for each area were taken as independent variables. Stepwise multiple regression analysis showed that the multiple R associated with time of day was 0.447 ($R^2$ = 0.200), and with both independent variables was 0.450 ($R^2$ = 0.202). Neither of the time variables, then, explained appreciable portions of the geographic variation in counts of horned lizards. On the other hand, Table 4 shows that season does influence success in counting P. mcallii and scats. The regression analysis simply shows that this effect was not a significant factor in the geographic variation expressed in Table 3.

The counts summarized in Appendix 1 were used to compute indexes of the relative abundance of P. mcallii in 65 townships (Appendix 2). The indexes were computed by scoring one point for each scat counted, 50 points for each lizard observed, and dividing the total points for a township by the number of sections examined. Abundance indexes ranged from zero to 58, but few indexes exceeded 15. Results of this procedure are illustrated in Fig. 7. This map shows at least four areas where the flat-tailed horned lizard is well represented today: the southern part of East Mesa, and particularly south of Ogilby in the vicinity of Gray's Well; the southeastern portion of the Yuha Basin and the vicinity of Signal Mountain, including Plot 15 as described by Turner et al. (1978);

south of Superstition Mountain; and north of Ocotillo Wells and Benson Dry Lake.

The abundance indexes in Appendix 2 were regressed on numbers of sections examined. This analysis (with all 65 townships) showed a highly significant non-zero slope ($F = 28.3$, $F_{.01} = 7.0$), indicating that abundance indexes were not independent of effort (i.e., higher abundance indexes tended to be associated with larger numbers of sections examined per township). This relationship was also true when the township (R8E, T11S) with an index of 55 was eliminated from the analysis. This relationship implies that the distribution of P. mcallii within a township (36 sq mi) is not homogeneous, and that as more extensive searches are made the probability of discovering a favorable site is enhanced. It follows, then, that township abundance indexes based on searches of $\leq 5$ sections are questionable.

Table 5 summarizes counts of harvester ant nests and other lizards in 458 sections in 12 areas. Relationships between the relative abundances of P. mcallii and horned lizards, scats and i) ant nests and ii) Chemidophorus tigris, Callisaurus draconoides, Dipsosaurus dorsalis and species of Uma were examined by simple linear regression analyses. These analyses were based on 11 of the 12 areas given in Table 3 (Area 6 was not included). Table 6 gives results of these tests. Counts of P. mcallii and horned lizard scats were statistically uncorrelated, and generally uncorrelated with counts of active harvester ant nests and other lizards. The one statistically significant correlation was between counts of horned lizards and counts of nests of Veromessor pergandei. This is a highly plausible association, but

the picture is clouded by the lack of correlation between lizards and their scats and scats and Veromessor nests. As pointed out previously, we generally worked in areas judged to be sparsely occupied or unoccupied by P. platyrhinos. However, there were a number of sections examined in areas where both species occurred, and a few sections may have been better habitat for P. platyrhinos than for P. mcallii. Overlap in the distributions of the two species will be discussed more fully later. Although the statistical correlations are insignificant, P. mcallii, Callisaurus draconoides and Dipososaurus dorsalis were often observed together.

Bureau of Land Management personnel are regularly required to make decisions as to appropriate land use. These decisions must take into account agricultural and mineral interests as well as aesthetic considerations relating to recreation and wildlife values. In Imperial County, for example, there are proposed and existing leases for gas and oil exploration, for development of geothermal resources, and for gathering sand and gravel used in agricultural drainage systems. Existing leases are periodically renewed unless problems associated with development arise. These decisions are influenced, to some extent, by the native plants and animals occupying areas in question. Hence, managers need information as to the distribution and abundance of sensitive species. Procedures enabling quick assessments of the status of such species in prospective leases are needed.

We experimented with two methods of making rapid, low-cost evaluations of the relative abundance of P. mcallii in Imperial County. One technique relied solely on counts of scats in a number of 10 x 10 m quadrats. Table

7 shows the frequency distribution of counts of scats in 40 such quadrats in the Yuha Basin. The mean number of scats per quadrat (~1) was low, and the usual expectancy was to observe none. The scats were non-randomly dispersed in the section, with 24 of the 39 counted in the southwest quarter and 9 in the northeast quarter. Scats were found more often in sandy areas than on desert pavement. These data suggest that it would be necessary to count scats in around 25-30 100-$m^2$ quadrats before the estimate of the mean would stabilize. Because these counts were made in an area known to be favorable habitat for P. mcallii, we concluded that counting scats in quadrats was not an efficient method of assessment because so many quadrats would have to be examined.

Our other approach was an extension of the basic section search, except that two people walked for two hours (four times the standard effort). Table 8 gives counts of horned lizards and scats in 19 sections in Imperial County. The situation in the Yuha Geothermal Lease Area was relatively easy to evaluate. The numbers of horned lizards observed per hour (0.10) was at a level associated with favorable habitats (see Table 3), and the numbers of scats counted per hour (7.4) was also high. Therefore, it was recommended that there be no surface occupancy of 8 sections where scat counts were highest, and that surface occupancy of 25 other sections in the lease area be restricted (USDI, Bureau of Land Management 1979).

A contrasting situation was found in the Superstition Mt. and Plaster City quadrangles, where an application had been filed for a new sand and gravel lease. Here, signs of P. mcallii were scant except in the eastern portion of Section 18. Fortunately, this area did not coincide with that

proposed for sand and gravel pits. Findings in the Painted Gorge quadrangle were less unequivocal, but the application for this area (and for those in the Glamis and Holtville NE quadrangles) was approved.

These findings, taken together with other field experience, lead us to the following conclusions. Attempting to determine the presence or relative abundance of P. mcallii by seeking the lizards themselves are not apt to be successful, unless a large-scale effort is mounted. The probability of observing lizards, even in good areas, is low. In an area where repeated experience showed P. mcallii to be well represented (e.g., the Yuha Basin) only about one lizard was observed for every ten hours of field work (Tables 3, 8). It is important that field workers count scats as well as lizards. Surveys are most effective in late April or May (Table 4). We recommend the search of a section by two people for two hours as an economically feasible technique for evaluating areas for management purposes. The larger the number of sections examined, the better placed the manager will be to make a good decision. Results of an inspection of a single section may be difficult to evaluate (Table 8). Counts of scats in areas near the edge of the flat-tailed lizard's distribution may be hard to assess because of the inability to distinguish between scats of P. mcallii and P. platyrhinos.

Although our 1979 survey was far from complete, we may draw a number of useful conclusions as to the present distribution and abundance of P. mcallii. While the geographic range of the species remains as broadly defined by Stebbins (1954, 1966), we can point out some discontinuities and develop newer ideas as to local habitat requirements. Figure 8 illustrates

the present geographic range of P. mcallii in California (the species also occurs in southwestern Arizona and portions of adjoining Mexico). The distribution of P. mcallii extends from near the confluence of the San Gorgonio and Whitewater Rivers in Riverside County, south and east through the Coachella Valley into Imperial County along both sides of the Salton Sea. From the area between the Salton Sea and the San Diego County line, the range extends west into the Borrego Valley, although there may be important discontinuities in the badlands south of the Santa Rosa Mountains. The species is generally restricted to elevations below 250 m in the Borrego Valley, and there are small extensions into the lower portions of the Coyote Creek watershed, around Clark Dry Lake and southwest along San Felipe Creek where it emerges from the Vallecito Mountains. P. mcallii occurs east of the northeastern edge of the Vallecitos and east and north of the Fish Creek Mountains at increasingly lower elevations--down to below sea level in western Imperial County. The distribution of P. mcallii in southern San Diego County is less clear, although there are old records from as far west as "Vallecito." This area is near Highway 52, probably in the Vallecito Valley. This valley, and the Carrizo Valley, descending to the southeast, were not explored in 1978. In 1978, however, Mark Jorgensen collected P. mcallii at an elevation of 520 m in Indian Gorge, west of the Bow Willow Ranger Station. The species may occur to the east of Bow Willow in Carrizo Wash. If populations in southeastern San Diego County and southwestern Imperial County are continuous, the connection is probably via this wash. The agricultural portions of south-central Imperial County extending east from the West Side Main Canal, Westmorland,

and the southern end of the Salton Sea to the Highline Canal; and from as far north as Niland to the Mexican border are essentially uninhabited by P. mcallii. The range extends eastward across East Mesa and the Algodones Dunes, except that the barren dunes themselves are not occupied. There are a few localities along the east side of the dunes, but the Chocolate Mountains, Cargo Muchacho Mountains and agricultural areas near Yuma probably separate California populations from those in Arizona. North of Niland there may be a narrow band of habitat between the Salton Sea and the Chocolate Mountains continuous with the southeastern portion of the Coachella Valley.

Most of the areas occupied by P. mcallii lie at lower elevations (e.g., <250 m above sea level) and are flat or with modest slopes. High numbers (>15) of scats were counted in a few sections in low hills where windblown sand had settled on slopes (near Ocotillo Wells). P. mcallii is even known to occur on the rocky lower slopes of Superstition Mountain, coexisting with chuckwallas and other saxicolous species. The best habitats for P. mcallii generally exhibited surface soils of fine packed sand, or pavement, overlain intermittantly with loose, fine sand. The idea that the species occurs "...only in areas of fine sand, sharing the habitat with fringe-toed lizards" (Stebbins 1966) needs to be carefully qualified. P. mcallii may occupy areas covered with small pebbles, or areas with sand and gravel. Although P. mcallii and species of Uma share many habitats, the horned lizards occur in areas unoccupied by Uma. The relative abundance of P. mcallii and of horned lizard scats (numbers counted per man-hour) were uncorrelated with numbers of Uma counted per

man-nour. In Imperial County, the most favoraole naoitats occur within the Carrizo-Cajon, (east of the Algodones Dunes, near Superstition Mountain), Vinton-Brazito (East Mesa, Yuha Basin, Mt. Signal), and Superstition-Acolita (East Mesa, Superstition Mountain, Yuha Basin) soil associations. In Imperial County, habitats above the old shoreline of Lake Canuilla (40 ft contour) are generally better than those below the shoreline, possibly because soils above the old shoreline tend to be sandier.

The vegetation in areas of favorable P. mcallii naoitat is usually quite simple, and some habitats are, as Stebbins (1966) pointed out, "...extremely barren country, where vegetation is sparse or lacking." The most characteristic perennial species are Larrea tridentata, Amorosia dumosa, and occasionally species of Atriplex. Of the naoitats with which we are familiar, the most complex perennial vegetation occurs in microphyll woodlands near the Algodones Dunes, or in some areas east of the dunes where the flora is enriched with Sonoran Desert species. P. mcallii is known to occur at the edges of vegetated sand dunes, on barren clay soils, and in sparse saltbush communities, but these records apparently represent dispersal from more suitable naoitats into marginal areas.

P. mcallii apparently does not occur in a number of naoitats well represented within its geographic range:

1. Rocky mountainous areas (e.g., the Santa Rosa and Chocolate Mountains).
2. New alluvial areas with sloping terrain, usually within three miles of mountains. Here soils are coarse, containing relatively larger particles and stones.

3. Salt flats and mud flats with little or no vegetation.
4. Major dune systems. The main body of the Algodones Dunes is uninhabited.
5. Marshes, tamarisk-arrowweed thickets and other areas of dense vegetation.
6. Agricultural and other developed areas.

Figure 9 illustrates the distribution of P. mcallii in Imperial and San Diego counties, and indicates apparently optimal habitats as inferred from soil types, vegetation and distributional records.

Although the ranges of P. mcallii and P. platyrhinos are often shown as roughly coextensive in southeastern California (e.g., Stebbins 1966), the two species are well separated in terms of their particular habitats. In general, as elevation, rainfall and plant diversity increase, P. mcallii gives way to P. platyrhinos. Records of P. platyrhinos in southeastern California are generally from the bases of mountains, or in canyons, or in rock washes on relatively young alluvial soils. However, in the ecotones between montane-alluvial areas and lower creosotebush flatlands, the two species often coexist. Both species occupy dry washes and may penetrate into habitat typically occupied by the other. Stebbins (in litt.) describes observing both species within 150 m of each other in the Coachella Valley. Both species have been recorded from Yuha Well, Font's Point, and in the vicinity of Coyote Wells. Thomas Sinclair has found both species almost side by side in the area bordering the west side of Clark Dry Lake.

## Discussion

The procedures adopted in 1979 were successful in identifying a number of favorable areas for P. mcallii in Imperial and San Diego Counties. The most remarkable of these is that lying north of Highway 78 in the vicinity of Ocotillo Wells and Benson Dry Lake (=Ocotillo Dry Lake). On two occasions, three P. mcallii were observed in one section in this area (Fig. 5). On May 3, Mark Jorgensen found three P. mcallii impaled on creosotebush by shrikes and on May 9, Robert Berry counted three horned lizards. It is interesting to note that this area was one favored by Klauber, who collected over 40 specimens of P. mcallii from "Benson's Dry Lake" (Reeve 1952). It seems likely that Klauber used this name in a general sense, and that lizards were collected from surrounding areas rather than on the lake bed. The region is dissected by extensive washes--particularly San Felipe Creek and Palo Verde Wash--and almost all of it lies between 50 and 100 m above sea level. The vegetation includes creosotebush, bur-sage, indigo bush, saltbush and ocotillo, and the lower portions of the landscape are exposed to flooding following heavy rains. Much of this area is embraced by the Ocotillo Wells State Vehicular Recreational Area, a 1,600-ha (4,000-ac) area administered by the Anza-Borrego Desert State Park. In addition to the horned lizards recorded in the course of section searches, State Park rangers regularly encountered P. mcallii along, or in, the roads while on patrols.

While the Ocotillo Wells area clearly emerged as the best of those we examined, we also found evidence of favorable habitats for P. mcallii in several other places. Phrynosoma mcallii is not an endangered species.

It is difficult to find, but this has apparently always been true (Klauber 1939, Norris 1949). Of greater importance is the fact that, whereas P. mcallii still exists comfortably in portions of its geographic range, it is disappearing in others. For example, areas developed for agriculture or housing in Riverside County and in the south-central portion of Imperial County are no longer inhabited by P. mcallii. There are also areas along the edge of the Salton Sea, now being developed for housing, where this species probably occurred. In the early 1960's P. mcallii was very abundant along the 11-km stretch of Highway 78 just west of the Algodones Dunes, but it is relatively rare in this area today.

It will never be possible to prove the causes of these changes, but we believe it prudent to assume that human activities are in some way implicated. It is certainly obvious that clearing land for housing tracts or agriculture and heavy and continued use of areas by vehicles create uninhabitable conditions for many types of desert wildlife. Continued expansion of human activities in deserts will result in unavoidable destruction or degradation of natural habitats, although a recognition of this danger can lead to some mitigation of adverse impacts. Society faces important choices in coming years, choices which can affect the quality of our deserts for many decades. If land development continues unabated we will be faced with an ever expanding roster of endangered species in the deserts of southeastern California.

Acknowledgments

Mark Dimmitt made the initial appraisals of potential habitat, drew up a prospective list of sections to be examined, and assisted with the early phases of the field work. The Office of the Bureau of Land Management in El Centro provided meeting places and office space. We thank Maurice Getty for arranging the generous cooperation of park rangers. Field work was carried out by William Berry, Pat Flannigan, Paul Johnson, Arthur Morley, Ray Perry, Robert Turner (all Anza-Borrego Desert State Park), Kenneth Asplund, Russell Duncan, Kristie Echols, Todd Esque, Margaret Fusari, Scott Inman, Karla Kramer, Philip Medica, Mark Rooby and Eugene Stewart. Benjamin Banta, Thomas Fritts, Thomas Sinclair and Glenn Stewart provided information as to records and present habitats of P. mcallii in San Diego and Imperial Counties. Kathy Bliss, Jean Kinnear, Gretchen Kiser and Melvin Stave assisted with analysis of field data. We gratefully acknowledge the cooperation and assistance of the U. S. Border Patrol.

Literature cited

Klauber, L. M. 1939. Studies of reptile life in the arid southwest. Bull. Zool. Soc. San Diego 14: 1-100.

Norris, K. S. 1949. Observations on the habits of the horned lizard, Phrynosoma m'callii. Copeia 1949: 176-180.

Reeve, W. L. 1952. Taxonomy and distribution of the horned lizard Genus Phrynosoma. Univ. Kans. Sci. Bull. 34, No. 14.

Stebbins, R. C. 1954. Amphibians and reptiles of western North America. McGraw-Hill Book Co., New York.

Stebbins, R. C. 1966. A field guide to western reptiles and amphibians. Houghton Mifflin Co., Boston.

Turner, F. B., P. A. Medica and H. O. Hill. 1978. The status of the flat-tailed horned lizard (Phrynosoma mcallii) at nine sites in Imperial and Riverside Counties, California. 1978 Annual Report to the Bureau of Land Management.

USDI, Bureau of Land Management. 1979. Environmental assessment record. Yuha Basin/Mt. Signal non-competitive leases for geothermal exploration/ development. Riverside District Office, BLM, Riverside, California, 131 pp. + Appendixes.

Table 1. Distribution of 1979 effort in 458 sections according to area and time of year.

| General area | Man-hours | Apr 15-28 (1) | Apr 29-May 12 (2) | May 13-26 (3) | May 27-June 9 (4) | June 10-23 (5) | June 24- (6) | Mean time of season |
|---|---|---|---|---|---|---|---|---|
| 1 Ogilby | 31 | 20 | 9 | - | - | - | 2 | 1.61 |
| 2 southern East Mesa | 100 | 5 | 68 | 8 | 3 | 6 | 10 | 2.67 |
| 3 northern East Mesa | 38 | 2 | 8 | 3 | 1 | 18 | 6 | 4.13 |
| 4 Durnid | 43 | - | 35 | 4 | - | 4 | - | 2.37 |
| 5 Riverside County | 42 | - | - | 3 | 8 | 15 | 16 | 5.05 |
| 6 Borrego Sink, Clark Lake | 7 | 1 | - | 4 | 2 | - | - | 3.00 |
| 7 Kane Spring | 43 | - | 19 | 14 | 10 | - | - | 2.79 |
| 8 Borrego Mountain | 35 | 2 | 6 | 26 | 1 | - | - | 2.74 |
| 9 Superstition Mountain | 36 | 3 | 2 | 4 | 25 | 2 | - | 3.60 |
| 10 Plaster City | 24 | 3 | 16 | 5 | - | - | - | 2.08 |
| 11 Coyote Wells | 17 | - | 14 | 3 | - | - | - | 2.18 |
| 12 Yuha Basin | 42 | 22 | 4 | 5 | 11 | - | - | 2.12 |

Table 2. Distribution of 1979 effort according to area and time of day. Areas are as in Table 1.

| Area | Hours 0500-0659 | 0700-0859 | 0900-1059 | 1100-1259 | 1300-1459 | 1500-1659 | 1700-1859 | Mean time of day |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 4 | 15 | 7 | 3 | - | 1 | 10.7 |
| 2 | 10 | 22 | 24 | 14 | 4 | 8 | 18 | 11.3 |
| 3 | 10 | 13 | 9 | 6 | - | - | - | 8.6 |
| 4 | - | 6 | 13 | 10 | 5 | - | 9 | 12.3 |
| 5 | 2 | 15 | 17 | 7 | - | 1 | - | 9.6 |
| 6 | - | - | 4 | 2 | - | 1 | - | 11.4 |
| 7 | 5 | 13 | 6 | 1 | - | 12 | 6 | 11.8 |
| 8 | - | 5 | 10 | 3 | 11 | 3 | 3 | 12.3 |
| 9 | - | 3 | 2 | 13 | 3 | 1 | 14 | 14.2 |
| 10 | - | 1 | 8 | 3 | 2 | 5 | 5 | 13.4 |
| 11 | 1 | 3 | 3 | 5 | 3 | 1 | 1 | 11.5 |
| 12 | 3 | 6 | 16 | 5 | 2 | 2 | 8 | 11.7 |

Table 3. Observations of horned lizards (Phrynosoma mcallii) and counts of horned lizard scats in 12 areas in southeastern California during 1979. Areas are as in Table 1.

| Area | Lizards observed | Scats counted | Lizards per hour | Scats per hour |
|---|---|---|---|---|
| 1 | 4 | 90 | 0.13 | 2.9 |
| 2 | 6 | 315 | 0.06 | 5.2 |
| 3 | 0 | 54 | 0.00 | 1.4 |
| 4 | 2 | 84 | 0.05 | 2.0 |
| 5 | 1 | 96 | 0.02 | 2.3 |
| 6 | 0 | 23 | 0.00 | 3.1 |
| 7 | 4 | 109 | 0.09 | 2.5 |
| 8 | 14[1] | 463 | 0.40 | 13.2 |
| 9 | 4 | 249 | 0.11 | 6.9 |
| 10 | 1 | 49 | 0.04 | 2.0 |
| 11 | 0 | 55 | 0.00 | 3.8 |
| 12 | 4 | 394 | 0.10 | 9.4 |

[1] including three dead

Table 4. Observations of horned lizards (Phrynosoma mcallii) and counts of horned lizard scats during 1979.

| Dates | Man-hours | Lizards observed | Scats counted | Lizards per hour | Scats per hour |
|---|---|---|---|---|---|
| Apr 15-28 | 58 | 8 | 305 | 0.14 | 5.3 |
| Apr 29-May 12 | 181 | 15 | 755 | 0.08 | 4.2 |
| May 13-26 | 79 | 12 | 588 | 0.15 | 7.4 |
| May 27-Jun 9 | 61 | 3 | 304 | 0.05 | 5.0 |
| June 10-23 | 45 | 2 | 108 | 0.04 | 2.4 |
| June 24- | 34 | 0 | 131 | 0.00 | 3.9 |

Table 5. Numbers of harvester ant nests and lizards observed in 458 sections in 1979. Areas are as in Table 1.

| Area | Nests of Veromessor pergandei | Nests of Pogonomyrmex californicus and P. magnacantha | Harvester ant nests (all 3 species) | Cnemidophorus tigris | Callisaurus draconoides | Dipsosaurus dorsalis | Uma spp. | Uta stansburiana | Crotaphytus wislizeni | Urosaurus graciosus | Phrynosoma platyrhinos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 120 | 137 | 257 | 110 | 295 | 230 | 270 | 3 | 0 | 9 | 0 |
| 2 | 264 | 455 | 719 | 71 | 84 | 177 | 87 | 16 | 0 | 16 | 0 |
| 3 | 254 | 366 | 620 | 34 | 48 | 22 | 13 | 14 | 2 | 1 | 0 |
| 4 | 86 | 273 | 359 | 40 | 181 | 54 | 22 | 36 | 0 | 11 | 1 |
| 5 | 129 | 97 | 226 | 0 | 9 | 89 | 65 | 7 | 0 | 0 | 7 |
| 6 | 20 | 5 | 25 | 10 | 10 | 30 | 8 | 0 | 0 | 4 | 0 |
| 7 | 182 | 70 | 252 | 9 | 62 | 28 | 0 | 3 | 0 | 0 | 0 |
| 8 | 426 | 20 | 446 | 20 | 254 | 96 | 11 | 2 | 0 | 12 | 0 |
| 9 | 84 | 22 | 106 | 2 | 43 | 61 | 30 | 1 | 0 | 0 | 0 |
| 10 | 98 | 27 | 125 | 14 | 54 | 16 | 0 | 3 | 1 | 6 | 0 |
| 11 | 91 | 16 | 107 | 31 | 48 | 40 | 0 | 0 | 2 | 0 | 4 |
| 12 | 152 | 29 | 181 | 12 | 131 | 67 | 11 | 5 | 1 | 0 | 1 |
| Totals | 1906 | 1517 | 3423 | 353 | 1219 | 910 | 517 | 90 | 6 | 59 | 13 |

Table 6. Results of regression analyses of counts of horned lizards (*Phrynosoma mcallii*) and horned lizard scats on counts of harvester ant nests and other lizards. Value of $F_{0.05}$ was 5.0 for all tests.

| Dependent variable (numbers counted per man-hour) | Independent variable (numbers counted per man-hour) | r | F |
|---|---|---|---|
| Horned lizards | nests of *Veromessor pergandei* | 0.70 | 8.4* |
| | nests of *Pogonomyrmex californicus* and *P. magnacantha* | -0.36 | 1.3 |
| | all harvester ant nests | 0.24 | 0.5 |
| | *Cnemidophorus tigris* | -0.02 | 0.0 |
| | *Callisaurus draconoides* | 0.58 | 4.6 |
| | *Diposaurus dorsalis* | 0.34 | 1.2 |
| | *Uma* spp. | 0.13 | 0.2 |
| | horned lizard scats | -0.05 | 0.0 |
| Horned lizard scats | nests of *Veromessor pergandei* | 0.56 | 4.2 |
| | nests of *Pogonomyrmex* spp. | -0.53 | 3.4 |
| | all harvester ant nests | 0.02 | 0.0 |
| | *Cnemidophorus tigris* | -0.23 | 0.5 |
| | *Callisaurus draconoides* | 0.32 | 1.0 |
| | *Diposaurus dorsalis* | 0.10 | 0.1 |
| | *Uma* spp. | -0.16 | 0.2 |

* $p = <0.05$

Table 7. Counts of scats in 40 100-$m^2$ quadrats in the Yuna Basin in April 1975.

| Number of scats counted | Number of quadrats |
|---|---|
| 0 | 27 |
| 1 | 3 |
| 2 | 4 |
| 3 | 4 |
| 4 | 1 |
| 12 | 1 |

Table 8. Counts of horned lizards (Phrynosoma mcallii) and horned lizard scats in lease areas in Imperial County. Each section was searched for two hours by two people.

| Lease type (and number) | Quadrangle | Sections examined | | | Lizards observed | Scats counted |
|---|---|---|---|---|---|---|
| Yuha Geothermal Lease Area | Mt. Signal | 12E | 17S | 11 | 2 | 125 |
| | | | | 12 | 0 | 13 |
| | | | | 13 | 0 | 15 |
| | | | | 14 | 1 | 17 |
| | | | | 15 | 0 | 30 |
| | | | | 21 | 0 | 19 |
| | | 13E | 17S | 19 | 0 | 18 |
| | Yuha Basin | 11E | 16S | 27 | 0 | 1 |
| | | | | 28 | 0 | 6 |
| | | | | 33 | 0 | 24 |
| | | | | 34 | 1 | 6 |
| | | 11E | 17S | 19 | 1 | 80 |
| Sand and gravel lease (CA-060-MP9-5,9,11,29,33) | Superstition Mountain | 11E | 15S | 12 | 0 | 2 |
| | | 12E | 15S | 7 | 0 | 0 |
| | Plaster City | 11E | 15S | 13 | 1 | 27 |
| Sand and gravel lease (CA-060-FP9-5) | Painted Gorge | 10E | 16S | 12 | 1 | 9 |
| Sand and gravel lease (CA-060-MP9-17) | Glamis | 18E | 14S | 2 | 0 | 0 |
| Sand and gravel lease (CA-060-MP9-13,14) | Holtville NE | 16E | 13S | 27 | 0 | 21 |
| | | 16E | 14S | 23 | 0 | 0 |

Appendix 1

Counts of horned lizards (Phrynosoma mcallii) and horned lizard scats in 460 sections in southeastern California during 1979.

| Area code | Date | | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|---|
| 1 | May | 3 | Gray's Well NE | 20 | 16 | 19 | 0 | 21 |
| | | 4 | | | | 32 | 0 | 5 |
| | | 3 | | | | 36 | 0 | 4 |
| | | 3 | | 21 | 16 | 19 | 0 | 2 |
| | | 2 | | | | 20 | 0 | 0 |
| | | 1 | | | | 20 | 0 | 9 |
| | | 3 | | | | 30 | 0 | 0 |
| | | 3 | | | | 31 | 0 | 2 |
| | | 2 | | | | 32 | 0 | 3 |
| | Jun | 25 | Ogilby | 19 | 14 | 22 | 0 | 0 |
| | | 25 | | | | 28 | 0 | 0 |
| | Apr | 28 | | 20 | 15 | 16 | 0 | 0 |
| | | 28 | | | | 21 | 0 | 0 |
| | | 28 | | | | 22 | 0 | 1 |
| | | 27 | | | | 26 | 0 | 0 |
| | | 28 | | | | 27 | 0 | 1 |
| | | 28 | | | | 28 | 0 | 0 |
| | | 27 | | | | 34 | 0 | 0 |
| | | 27 | | | | 35 | 0 | 0 |
| | | 27 | | | | 36 | 0 | 0 |
| | | 19 | | | 16 | 2 | 0 | 0 |
| | | 19 | | | | 3 | 0 | 2 |
| | | 27 | | | | 10 | 1 | 2 |
| | | 19 | | | | 11 | 0 | 2 |
| | | 19 | | | | 12 | 0 | 0 |
| | | 19 | | | | 13 | 0 | 8 |

Appendix 1 (cont.)

| Area code | Date | | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|---|
| 1 | Apr | 19 | Ogilby | 20 | 16 | 14 | 0 | 2 |
| | | 27 | | | | 15 | 1 | 15 |
| | | 27 | | | | 22 | 0 | 8 |
| | | 26 | | | | 23 | 1 | 0 |
| | | 26 | | | | 24 | 1 | 3 |
| 2 | May | 4 | Glamis SE | 18 | 15 | 16 | 0 | 0 |
| | Jun | 12 | | | | 21 | 0 | 1 |
| | May | 2 | | | | 22 | 0 | 0 |
| | Jun | 1 | | | | 26 | 0 | 4 |
| | | 1 | | | | 36 | 0 | 1 |
| | Jun | 28 | | | 16 | 3 | 0 | 8 |
| | | 28 | | | | 10 | 0 | 2 |
| | | 28 | | | | 15 | 0 | 1 |
| | May | 2 | | 19 | 15 | 18 | 0 | 0 |
| | | 2 | | | | 19 | 0 | 0 |
| | | 2 | | | | 20 | 0 | 1 |
| | | 2 | | | | 28 | 1 | 0 |
| | | 2 | | | | 32 | 0 | 2 |
| | | 2 | | | | 33 | 0 | 0 |
| | Jul | 12 | | | 16 | 6 | 0 | 9 |
| | | 12 | | | | 7 | 0 | 23 |
| | Jun | 1 | | | | 9 | 0 | 5 |
| | Jul | 12 | | | | 18 | 0 | 8 |
| | Apr | 26 | Glamis SW | 17 | 15 | 17 | 0 | 13 |
| | | 26 | | | | 20 | 0 | 2 |
| | Jun | 12 | | | | 21 | 0 | 5 |
| | | 12 | | | | 22 | 0 | 2 |
| | Jul | 6 | Glamis SW | 17 | 15 | 24 | 0 | 9 |
| | | 6 | | | | 25 | 0 | 4 |

Appendix 1 (cont.)

| Area code | Date | Quadrangle | Range (E) | Townsnip (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|
| 2 | Jun 13 | Glamisn SW | 17 | 15 | 33 | 0 | 13 |
| | 13 | | | | 34 | 1 | 9 |
| | Jul 6 | | | | 36 | 0 | 4 |
| | 11 | | | 16 | 2 | 0 | 11 |
| | May 14 | | | | 4 | 0 | 10 |
| | 14 | | | | 5 | 0 | 6 |
| | 14 | | | | 7 | 0 | 0 |
| | 14 | | | | 8 | 0 | 2 |
| | Jul 11 | | | | 11 | 0 | 8 |
| | 11 | | | | 14 | 0 | 1 |
| | May 14 | | | | 15 | 0 | 0 |
| | 14 | | | | 16 | 0 | 0 |
| | 14 | | | | 17 | 0 | 0 |
| | 14 | | | | 18 | 0 | 0 |
| | Jul 6 | | 18 | 15 | 18 | 0 | 1 |
| | Jun 12 | | | | 20 | 0 | 0 |
| | Jul 3 | | | 16 | 5 | 0 | 0 |
| | 3 | | | | 8 | 0 | 2 |
| | 3 | | | | 17 | 0 | 0 |
| | May 1 | Gray's well | 19 | 16 | 22 | 0 | 33 |
| | 5 | | | | 23 | 0 | 27 |
| | 3 | | | | 24 | 0 | 0 |
| | 3 | | | | 25 | 0 | 14 |
| | 1 | | | | 26 | 0 | 33 |
| | 1 | | | | 27 | 0 | 17 |
| | 1 | | | | 34 | 0 | 14 |
| | 4 | | | 17 | 2 | 0 | 0 |
| | May 3 | Gray's Well | 20 | 16 | 25 | 0 | 9 |
| | 31 | | | | 30 | 0 | 10 |
| | 31 | | | | 31 | 0 | 14 |
| | 2 | | 21 | 16 | 21 | 0 | 0 |

Appendix 1 (cont.)

| Area code | Date | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|
| 2 | 2 | Gray's well | 21 | 16 | 28 | 0 | 0 |
| | 2 | | | | 33 | 0 | 3 |
| | Apr 26 | Holtville East | 17 | 15 | 18 | 0 | 0 |
| | 26 | | | | 19 | 0 | 7 |
| | May 4 | Midway Well | 17 | 16 | 25 | 0 | 0 |
| | 5 | | | | 34 | 0 | 0 |
| | 4 | | | | 36 | 0 | 15 |
| | Apr 30 | | 18 | 16 | 22 | 0 | 10 |
| | 30 | | | | 23 | 0 | 12 |
| | 29 | | | | 24 | 0 | 15 |
| | 29 | | | | 25 | 0 | 25 |
| | 3 | | | | 26 | 0 | 3 |
| | 30 | | | | 27 | 0 | 3 |
| | 30 | | | | 34 | 0 | 5 |
| | 25 | | | | 35 | 0 | 5 |
| | 29 | | | | 36 | 0 | 3 |
| | May 6 | | | 17 | 5 | 0 | 0 |
| | Apr 29 | Midway Well | 19 | 16 | 19 | 0 | 4 |
| | 29 | | | | 20 | 0 | 2 |
| | 29 | | | | 21 | 0 | 7 |
| | 29 | | | | 28 | 0 | 9 |
| | 29 | | | | 29 | 1 | 1 |
| | 29 | | | | 30 | 1 | 7 |
| | 29 | | | | 31 | 0 | 0 |
| | 30 | | | | 32 | 0 | 3 |
| | 30 | | | | 33 | 0 | 12 |
| | May 6 | Midway Well NW | 17 | 16 | 1 | 0 | 0 |
| | 5 | | | | 12 | 0 | 0 |
| | 5 | | | | 21 | 0 | 0 |
| | 4 | | | | 22 | 0 | 0 |
| | 4 | | | | 23 | 1 | 5 |

Appendix 1 (cont.)

| Area code | Date | Quadrangle | Range (E) | Townsnip (E) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|
| 2 | May 5 | | 17 | 16 | 24 | 0 | 0 |
| | 4 | | | | 26 | 0 | 2 |
| | 6 | | | 17 | 2 | 0 | 0 |
| | 6 | | | | 3 | 0 | 0 |
| | 6 | | | | 4 | 0 | 0 |
| | 6 | | | | 9 | 0 | 0 |
| | 6 | | | | 10 | 0 | 0 |
| | 6 | | | | 11 | 0 | 0 |
| | 6 | | 18 | 16 | 21 | 0 | 15 |
| | 6 | | | | 28 | 0 | 0 |
| | 5 | | | | 29 | 0 | 0 |
| | 5 | | | | 30 | 0 | 1 |
| | 7 | | | | 32 | 0 | 0 |
| | 5 | | | | 33 | 0 | 3 |
| 3 | Jun 6 | Acolita | 17 | 13 | 21 | 0 | 0 |
| | 22 | Amos | 15 | 12 | 24 | 0 | 0 |
| | 21 | | 16 | 12 | 20 | 0 | 5 |
| | 21 | | | | 28 | 0 | 2 |
| | 22 | | | | 31 | 0 | 0 |
| | 21 | | | | 35 | 0 | 0 |
| | 18 | | | 13 | 1 | 0 | 0 |
| | 22 | | | | 9 | 0 | 0 |
| | 20 | | | | 15 | 0 | 0 |
| | 20 | | | | 16 | 0 | 7 |
| | 22 | | | | 22 | 0 | 2 |
| | 25 | Glamis | 18 | 13 | 34 | 0 | 5 |
| | May 31 | | | 14 | 1 | 0 | 0 |
| | 4 | | | | 28 | 0 | 1 |
| | 4 | | | | 33 | 0 | 0 |
| | Jun 25 | | 19 | 14 | 18 | 0 | 3 |

Appendix 1 (cont.)

| Area Code | Date | | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|---|
| 3 | Apr | 25 | Glamis NW | 17 | 13 | 33 | 0 | 0 |
| | | 25 | | | 14 | 2 | 0 | 0 |
| | Jul | 13 | | | | 13 | 0 | 0 |
| | | 13 | | | | 14 | 0 | 0 |
| | | 13 | | | | 15 | 0 | 1 |
| | | 14 | | | | 20 | 0 | 0 |
| | | 14 | | | | 30 | 0 | 2 |
| | | 15 | | | | 35 | 0 | 6 |
| | | 15 | | | 15 | 1 | 0 | 1 |
| | | 15 | | | | 2 | 0 | 0 |
| | Jun | 20 | Holtville NE | 16 | 13 | 26 | 0 | 4 |
| | | 18 | | | | 36 | 0 | 3 |
| | | 18 | | | 14 | 1 | 0 | 3 |
| | May | 1 | | | | 2 | 0 | 1 |
| | | 1 | | | | 11 | 0 | 0 |
| | | 26 | | | | 12 | 0 | 1 |
| | | 1 | | | | 13 | 0 | 6 |
| | | 1 | | | | 24 | 0 | 0 |
| | | 1 | | | | 25 | 0 | 0 |
| | | 1 | | | | 36 | 0 | 0 |
| | | 26 | | 17 | 13 | 31 | 0 | 0 |
| | | 26 | | | 14 | 6 | 0 | 1 |
| 4 | | 9 | Durmid | 11 | 8 | 8 | 0 | 0 |
| | | 9 | | | | 9 | 0 | 0 |
| | | 8 | | | | 11 | 0 | 0 |
| | | 8 | | | | 12 | 0 | 1 |
| | | 8 | | | | 13 | 0 | 0 |
| | | 8 | | | | 14 | 0 | 0 |
| | | 9 | | | | 17 | 0 | 11 |
| | | 9 | | | | 18 | 0 | 7 |

Appendix 1 (cont.)

| Area Code | Date | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|
| 4 | 9 | | | | 20 | 0 | 2 |
| | 9 | | | | 21 | 0 | 1 |
| | 8 | | | | 23 | 0 | 12 |
| | 8 | | | | 24 | 0 | 1 |
| | 8 | | | | 24 | 0 | 1 |
| | 8 | | | | 25 | 1 | 8 |
| | May 8 | Durmid | 11 | 8 | 26 | 0 | 6 |
| | 10 | | | | 28 | 0 | 1 |
| | 10 | | | | 34 | 0 | 0 |
| | 10 | | | 9 | 2 | 0 | 3 |
| | 10 | | | | 3 | 0 | 2 |
| | 10 | | | | 4 | 0 | 0 |
| | 10 | | | | 12 | 0 | 1 |
| | 10 | | | | 13 | 0 | 0 |
| | 10 | | | | 14 | 0 | 0 |
| | 11 | | 12 | 9 | 6 | 0 | 0 |
| | 11 | | | | 7 | 0 | 12 |
| | 11 | | | | 18 | 1 | 3 |
| | 11 | Frink | 12 | 9 | 4 | 0 | 0 |
| | 11 | | | | 8 | 0 | 2 |
| | 12 | | | | 22 | 0 | 0 |
| | 12 | | | | 23 | 0 | 0 |
| | 13 | | 13 | 9 | 29 | 0 | 0 |
| | 13 | | | | 30 | 0 | 0 |
| | 12 | Frink NW | 12 | 9 | 21 | 0 | 0 |
| | 12 | | | | 26 | 0 | 0 |
| | 12 | | | | 27 | 0 | 0 |
| | 12 | | | | 28 | 0 | 2 |
| | 12 | | | | 33 | 0 | 6 |
| | 12 | | | | 34 | 0 | 0 |
| | 11 | | | 9 | 9 | 0 | 0 |

Appendix 1 (cont.)

| Area Code | Date | | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|---|
| 4 | May | 13 | Frink NW | 13 | 9 | 18 | 0 | 0 |
| | Jun | 13 | Iris | 15 | 11 | 14 | 0 | 3 |
| | | 13 | | | | 15 | 0 | 0 |
| | | 13 | | | | 20 | 0 | 0 |
| | | 13 | | | | 21 | 0 | 0 |
| 5 | Jun | 18 | Cathedral City | 5 | 4 | 6 | 0 | 3 |
| | | 18 | | | | 8 | 0 | 1 |
| | May | 26 | | | | 9 | 0 | 10 |
| | Jun | 18 | | | | 10 | 0 | 6 |
| | May | 26 | | | | 14 | 0 | 15 |
| | | 26 | | | | 22 | 0 | 5 |
| | Jun | 19 | | | | 25 | 0 | 2 |
| | | 18 | | 6 | 4 | 6 | 0 | 0 |
| | | 19 | | | | 7 | 0 | 2 |
| | | 19 | | | | 30 | 0 | 0 |
| | | 19 | | | | 31 | 0 | 0 |
| | Jul | 3 | Desert Hot Springs | 4 | 3 | 9 | 0 | 0 |
| | Jun | 22 | | | | 19 | 1 | 3 |
| | | 22 | | | | 20 | 0 | 5 |
| | | 22 | | | | 21 | 0 | 3 |
| | | 22 | | | | 22 | 0 | 4 |
| | | 21 | | | | 27 | 0 | 1 |
| | Jul | 7 | Indio | 8 | 5 | 20 | 0 | 0 |
| | | 14 | La Quinta | 6 | 5 | 14 | 0 | 4 |
| | | 14 | | | | 15 | 0 | 3 |
| | | 14 | | 7 | 5 | 19 | 0 | 4 |
| | Jun | 21 | | | 6 | 8 | 0 | 0 |
| | Jul | 7 | Lost Horse Mountain | 3 | 4 | 31 | 0 | 0 |
| | | 7 | | | | 32 | 0 | 0 |
| | | 7 | | | 5 | 5 | 0 | 0 |
| | | 6 | Mortmar | 10 | 7 | 34 | 0 | 0 |

Appendix 1 (cont.)

| Area Code | Date | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|
| 5 | May 31 | Myoma | 6 | 4 | 23 | 0 | 0 |
| | 31 | | | | 24 | 0 | 0 |
| | Jun 1 | | | | 25 | 0 | 0 |
| | 1 | | | | 26 | 0 | 2 |
| | 2 | | 7 | 4 | 31 | 0 | 0 |
| | May 31 | | 6 | 4 | 35 | 0 | 2 |
| | 31 | | | | 36 | 0 | 5 |
| | Jun 1 | | 7 | 5 | 5 | 0 | 0 |
| | Jul 6 | Oasis | 8 | 8 | 23 | 0 | 0 |
| | 6 | | | | 25 | 0 | 1 |
| | 6 | | 9 | 8 | 18 | 0 | 6 |
| | Jun 21 | Palm Springs | 4 | 3 | 35 | 0 | 1 |
| | 21 | | | | 36 | 0 | 2 |
| | Jul 3 | Seven Palms Valley | 5 | 3 | 15 | 0 | 2 |
| | 3 | | | | 16 | 0 | 1 |
| | 3 | | 6 | 3 | 19 | 0 | 0 |
| 6 | May 13 | Borrego Sink | 7 | 11 | 19 | 0 | 0 |
| | 13 | | | | 29 | 0 | 0 |
| | 15 | | | | 31 | 0 | 0 |
| | Apr 20 | Clark Lake | 6 | 10 | 14 | 0 | 2 |
| | Jun 3 | | 7 | 10 | 19 | 0 | 2 |
| | 3 | | | | 20 | 0 | 0 |
| | May 17 | | | | 30 | 0 | 19 |
| 7 | 1 | Harper's Well | 10 | 12 | 19 | 0 | 13 |
| | 8 | | | | 21 | 0 | 1 |
| | 8 | | | | 22 | 0 | 1 |
| | 1 | | | | 30 | 0 | 9 |
| | Apr 30 | | | | 31 | 0 | 3 |
| | Jun 4 | Kane Spring | 11 | 12 | 19 | 0 | 0 |

Appendix 1 (cont.)

| Area Code | Date | | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|---|
| 7 | Jun | 2 | Kane Spring | 11 | 12 | 20 | 0 | 0 |
| | | 3 | | | | 21 | 0 | 0 |
| | | 5 | | | | 26 | 0 | 0 |
| | | | | | | 27 | 0 | 1 |
| | | 3 | | | | 28 | 0 | 0 |
| | | 3 | | | | 29 | 0 | 0 |
| | | 3 | | | | 30 | 0 | 0 |
| | May | 5 | Kane Spring NW | 9 | 12 | 12 | 0 | 0 |
| | | 6 | | | | 13 | 0 | 7 |
| | | 10 | | 10 | 11 | 3 | 0 | 0 |
| | | 10 | | | | 4 | 0 | 0 |
| | | 23 | | | | 7 | 0 | 13 |
| | | 23 | | | | 9 | 0 | 5 |
| | | 24 | | | | 10 | 0 | 4 |
| | | 23 | | | | 15 | 0 | 5 |
| | | 9 | | | | 23 | 0 | 0 |
| | | 9 | | | | 26 | 0 | 0 |
| | | 5 | | | 12 | 7 | 1 | 13 |
| | | 6 | | | | 8 | 0 | 0 |
| | | 9 | | | | 9 | 0 | 0 |
| | | 7 | | | | 10 | 0 | 1 |
| | | 8 | | | | 11 | 0 | 0 |
| | | 22 | | | | 13 | 1 | 1 |
| | | 8 | | | | 14 | 0 | 0 |
| | | 7 | | | | 15 | 0 | 0 |
| | | 9 | | | | 16 | 0 | 0 |
| | | 6 | | | | 17 | 0 | 0 |
| | | 6 | | | | 18 | 1 | 5 |
| | | 22 | Kane Spring NE | 11 | 12 | 6 | 1 | 0 |
| | | 22 | | | | 7 | 0 | 13 |

Appendix 1 (cont.)

| Area Code | Date | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|
| 7 | May 22 | Kane Spring NE | 11 | 12 | 17 | 0 | 13 |
| | 22 | | | | 18 | 0 | 0 |
| | 18 | Seventeen Palms | 9 | 9 | 27 | 0 | 0 |
| | 18 | | | | 34 | 0 | 1 |
| | 18 | | | | 35 | 0 | 0 |
| | 17 | | | 10 | 2 | 0 | 0 |
| | 17 | | | | 11 | 0 | 0 |
| 8 | 15 | Borrego Mountain | 7 | 11 | 33 | 0 | 0 |
| | 9 | | | 12 | 3 | 0 | 3 |
| | 9 | | | | 4 | 0 | 0 |
| | 2 | | | | 11 | 0 | 0 |
| | 9 | | 8 | 11 | 9 | 0 | 8 |
| | 9 | | | | 10 | 0 | 20 |
| | 20 | Borrego Mountain | 8 | 11 | 15 | 0 | 29 |
| Apr | 29 | | | | 16 | 1 | 18 |
| | 22 | | | | 20 | 0 | 13 |
| | 19 | | | | 21 | 1 | 3 |
| May | 20 | | | | 22 | 0 | 38 |
| | 20 | | | | 27 | 0 | 50 |
| | 13 | | | | 28 | 0 | 7 |
| Apr | 22 | | | | 29 | 0 | 0 |
| May | 13 | | | | 32 | 3 | 4 |
| | 13 | | | | 33 | 0 | 2 |
| | 20 | | | | 34 | 1 | 38 |
| | 21 | | | 12 | 3 | 1 | 1 |
| | 21 | | | | 4 | 0 | 0 |
| | 21 | | | | 9 | 0 | 0 |
| | 21 | Harper Canyon | | | 16 | 0 | 0 |
| | 21 | | | | 17 | 0 | 0 |
| | 20 | | | | 21 | 0 | 0 |
| | 20 | | | | 22 | 0 | 0 |

Appendix 1 (cont.)

| Area Code | Date | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|
| 8 | May 20 | Shell Reef | 8 | 11 | 27 | 0 | 1 |
| | 20 | | | | 28 | 0 | 0 |
| | 19 | Shell Reef | | 11 | 23 | 0 | 57 |
| | 19 | | | | 24 | 0 | 19 |
| | 19 | | | | 25 | 3 | 55 |
| | 20 | | | | 26 | 1 | 39 |
| | 20 | | | | 35 | 2 | 14 |
| | 20 | | | | 36 | 1 | 33 |
| | 16 | | 9 | 12 | 14 | 0 | 0 |
| | 17 | | | | 15 | 0 | 1 |
| | 17 | | | | 16 | 0 | 0 |
| 9 | May 8 | Plaster City NW | 10 | 14 | 4 | 1 | 0 |
| | 22 | | | | 9 | 0 | 1 |
| | 22 | | | | 15 | 0 | 3 |
| | 22 | | | | 23 | 0 | 4 |
| | 8 | | | | 26 | 0 | 9 |
| | Jun 7 | | | | 35 | 1 | 8 |
| | 7 | | | | 36 | 0 | 0 |
| | 6 | Superstition Mountain | 11 | 14 | 11 | 0 | 0 |
| | 6 | | | | 12 | 0 | 1 |
| | 7 | | | | 13 | 0 | 18 |
| | 9 | | | | 17 | 0 | 20 |
| | 9 | | | | 20 | 0 | 4 |
| | 8 | | | | 21 | 0 | 2 |
| | 8 | | | | 22 | 0 | 21 |
| | Apr 23 | | | | 23 | 0 | 16 |
| | 23 | | | | 24 | 1 | 9 |
| | Jun 8 | | | | 26 | 0 | 2 |
| | 8 | | | | 27 | 0 | 2 |
| | 8 | | | | 28 | 0 | 1 |

Appendix 1 (cont.)

| Area Code | Date | | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|---|
| 9 | Jun | 9 | Superstition Mountain | 11 | 14 | 29 | 0 | 1 |
| | | 9 | | | | 32 | 0 | 9 |
| | | 8 | | | | 33 | 0 | 17 |
| | | 8 | | | | 34 | 0 | 20 |
| | | 8 | | | | 35 | 0 | 1 |
| | | 10 | | | 15 | 1 | 0 | 0 |
| | Apr | 23 | | | | 12 | 0 | 0 |
| | Jun | 7 | | 12 | 14 | 5 | 0 | 17 |
| | | 7 | | | | 6 | 0 | 2 |
| | | 6 | | | | 7 | 1 | 27 |
| | | 7 | | | | 8 | 0 | 2 |
| | | 7 | | | | 17 | 0 | 7 |
| | | 7 | | | | 18 | 0 | 1 |
| | | 9 | | | | 19 | 0 | 3 |
| | | 9 | | | | 20 | 0 | 7 |
| | | 9 | | | | 30 | 0 | 12 |
| | | 10 | | 12 | 15 | 6 | 0 | 2 |
| 10 | May | 19 | Painted Gorge | 10 | 15 | 15 | 1 | 0 |
| | | 19 | | | | 22 | 0 | 0 |
| | | 19 | | | | 23 | 0 | 0 |
| | | 19 | | | | 25 | 0 | 0 |
| | | 19 | | | | 26 | 0 | 6 |
| | | 19 | | | | 27 | 0 | 0 |
| | Apr | 30 | | | 16 | 1 | 0 | 2 |
| | | 30 | | | | 2 | 0 | 0 |
| | May | 4 | | | | 12 | 0 | 12 |
| | | 4 | | | | 13 | 0 | 10 |
| | | 4 | | | | 14 | 0 | 7 |
| | Apr | 30 | | | | 16 | 0 | 0 |

Appendix 1 (cont.)

| Area Code | Date | | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|---|
| 10 | Apr | 30 | Painted Gorge | 10 | 16 | 21 | 0 | 2 |
| | May | 5 | | 11 | 16 | 19 | 0 | 1 |
| | Apr | 19 | Plaster City | 11 | 15 | 32 | 0 | 0 |
| | May | 4 | | | 16 | 7 | 0 | 0 |
| | | 3 | | | | 9 | 0 | 2 |
| | | 3 | | | | 10 | 0 | 1 |
| | | 3 | | | | 11 | 0 | 0 |
| | | 2 | | | | 12 | 0 | 0 |
| | | 3 | | | | 14 | 0 | 1 |
| | | 3 | | | | 15 | 0 | 2 |
| | Jun | 5 | | | | 20 | 0 | 3 |
| | Apr | 19 | | | | 23 | 0 | 0 |
| 11 | May | 9 | Carrizo Mountain | 9 | 16 | 14 | 0 | 21 |
| | | 9 | | | | 20 | 0 | 0 |
| | | 9 | | | | 21 | 0 | 0 |
| | | 9 | | | | 23 | 0 | 3 |
| | | 9 | | | | 24 | 0 | 25 |
| | | 9 | | | | 28 | 0 | 3 |
| | | 2 | Coyote wells | 9 | 16 | 25 | 0 | 0 |
| | | 3 | | | | 36 | 0 | 0 |
| | | 3 | | 9.5 | 16.5 | 1 | 0 | 0 |
| | | 2 | | 10 | 16 | 29 | 0 | 0 |
| | | 2 | | | | 30 | 0 | 1 |
| | | 2 | | | | 31 | 0 | 0 |
| | | 2 | | | | 32 | 0 | 0 |
| | | 3 | | | 16.5 | 6 | 0 | 0 |
| | | 14 | Inko-Pah Gorge | 9 | 16 | 33 | 0 | 2 |
| | | 14 | | | | 34 | 0 | 5 |
| | | 16 | | | | 35 | 0 | 5 |
| 12 | | 31 | Mt Signal | 12 | 16 | 33 | 0 | 8 |
| | | 31 | | | 16.5 | 2 | 0 | 2 |

Appendix 1 (cont.)

| Area Code | Date | | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|---|
| 12 | May | 31 | Mt Signal | 12 | 16.5 | 3 | 1 | 2 |
| | | 31 | | | | 4 | 0 | 13 |
| | Jun | 1 | | | 17 | 2 | 0 | 18 |
| | | 6 | | | | 3 | 0 | 12 |
| | | 1 | | | | 10 | 0 | 54 |
| | | 1 | | | | 11 | 1 | 22 |
| | Apr | 19 | | | | 12 | 0 | 0 |
| | | 19 | | | | 13 | 1 | 15 |
| | | 19 | | | | 14 | 0 | 0 |
| | | 18 | | | | 15 | 0 | 24 |
| | | 20 | | | | 21 | 0 | 21 |
| | | 19 | | | | 22 | 0 | 5 |
| | | 19 | | | | 23 | 0 | 9 |
| | | 19 | | | | 24 | 0 | 1 |
| | May | 15 | | 13 | 17 | 18 | 0 | 6 |
| | | 7 | Yuha Basin | 11 | 16.5 | 3 | 0 | 2 |
| | | 7 | | | | 4 | 0 | 1 |
| | | 7 | | | | 5 | 0 | 0 |
| | | 7 | | | | 6 | 0 | 1 |
| | | 31 | | | 17 | 11 | 0 | 0 |
| | | 31 | | | | 12 | 0 | 2 |
| | Apr | 25 | | | | 13 | 0 | 9 |
| | | 25 | | | | 14 | 0 | 4 |
| | | 26 | | | | 15 | 0 | 3 |
| | | 27 | | | | 16 | 0 | 5 |
| | May | 31 | | | | 17 | 0 | 0 |
| | | 31 | | | | 20 | 0 | 8 |
| | Apr | 27 | | | | 21 | 0 | 14 |
| | | 27 | | | | 22 | 0 | 1 |
| | | 25 | | | | 23 | 0 | 35 |
| | | 26 | | | | 24 | 0 | 7 |

Appendix 1 (cont.)

| Area Code | Date | Quadrangle | Range (E) | Township (S) | Section | Lizards | Scats |
|---|---|---|---|---|---|---|---|
| 12 | May 23 | Yuna Basin | 12 | 16 | 31 | 0 | 42 |
| | 23 | | | | 32 | 0 | 7 |
| | 23 | | | 16.5 | 6 | 0 | 10 |
| | 23 | | | 17 | 4 | 0 | 13 |
| | 27 | | | | 7 | 0 | 2 |
| | 27 | | | | 8 | 0 | 3 |
| | Apr 20 | | | | 17 | 0 | 2 |
| | 25 | | | | 18 | 1 | 7 |
| | 20 | | | | 20 | 0 | 4 |

Appendix 2

Counts of *Phrynosoma mcallii* and horned lizard scats in 65 townships in California in 1970.

| Range (E) | Township (S) | Sections examined | Number of lizards counted | Number of scats counted | Abundance index |
|---|---|---|---|---|---|
| 4 | 3 | 8 | 1 | 19 | 8.6 |
| 5 | 3 | 2 | 0 | 3 | 1.5 |
| 5 | 4 | 7 | 0 | 45 | 6.4 |
| 6 | 3 | 1 | 0 | 0 | 0 |
| 6 | 4 | 10 | 0 | 11 | 1.1 |
| 6 | 5 | 2 | 0 | 7 | 3.5 |
| 6 | 10 | 1 | 0 | 2 | 2.0 |
| 7 | 4 | 1 | 0 | 0 | 0 |
| 7 | 5 | 2 | 0 | 4 | 2.0 |
| 7 | 6 | 1 | 0 | 0 | 0 |
| 7 | 10 | 3 | 0 | 21 | 7.0 |
| 7 | 11 | 4 | 0 | 0 | 0 |
| 7 | 12 | 3 | 0 | 3 | 1.0 |
| 8 | 4 | 2 | 0 | 0 | 0 |
| 8 | 5 | 2 | 0 | 0 | 0 |
| 8 | 8 | 2 | 0 | 1 | 0.5 |
| 8 | 11 | 19 | 13 | 457 | 58.3 |
| 8 | 12 | 9 | 1 | 2 | 5.8 |
| 9 | 8 | 1 | 0 | 5 | 6.0 |
| 9 | 9 | 3 | 0 | 1 | 0.3 |
| 9 | 10 | 2 | 0 | 0 | 0 |
| 9 | 12 | 5 | 0 | 8 | 1.6 |
| 9 | 16 | 12 | 0 | 64 | 5.3 |
| 10 | 7 | 1 | 0 | 0 | 0 |
| 10 | 11 | 8 | 0 | 27 | 3.4 |
| 10 | 12 | 16 | 3 | 47 | 12.3 |
| 10 | 14 | 7 | 2 | 25 | 17.9 |
| 10 | 15 | 6 | 1 | 5 | 9.3 |
| 10 | 16 | 12 | 0 | 34 | 2.8 |

Appendix 2 (cont.)

| Range (E) | Township (S) | Sections examined | Number of lizards counted | Number of scats counted | Abundance Index |
|---|---|---|---|---|---|
| 11 | 8 | 16 | 1 | 50 | 6.3 |
| 11 | 9 | 6 | 0 | 6 | 1.0 |
| 11 | 12 | 12 | 1 | 27 | 6.4 |
| 11 | 14 | 17 | 1 | 144 | 11.4 |
| 11 | 15 | 3 | 0 | 0 | 0 |
| 11 | 16 | 14 | 0 | 14 | 1.0 |
| 11 | 17 | 12 | 0 | 88 | 7.3 |
| 12 | 8 | 6 | 0 | 8 | 1.2 |
| 12 | 9 | 8 | 1 | 17 | 8.4 |
| 12 | 14 | 9 | 1 | 78 | 14.2 |
| 12 | 15 | 1 | 0 | 2 | 2.0 |
| 12 | 16 | 7 | 1 | 84 | 19.1 |
| 12 | 17 | 18 | 3 | 212 | 20.1 |
| 13 | 9 | 3 | 0 | 0 | 0 |
| 13 | 17 | 1 | 0 | 6 | 6.0 |
| 15 | 11 | 4 | 0 | 3 | 0.8 |
| 15 | 12 | 1 | 0 | 0 | 0 |
| 16 | 12 | 4 | 0 | 7 | 1.8 |
| 16 | 13 | 7 | 0 | 16 | 2.3 |
| 16 | 14 | 8 | 0 | 11 | 1.4 |
| 17 | 13 | 3 | 0 | 0 | 0 |
| 17 | 14 | 8 | 0 | 10 | 1.3 |
| 17 | 15 | 13 | 1 | 69 | 9.2 |
| 17 | 16 | 21 | 1 | 60 | 5.2 |
| 17 | 17 | 6 | 0 | 0 | 0 |
| 18 | 13 | 1 | 0 | 5 | 5.0 |
| 18 | 14 | 3 | 0 | 1 | 0.3 |
| 18 | 15 | 7 | 0 | 7 | 1.0 |
| 18 | 16 | 21 | 0 | 113 | 5.3 |
| 18 | 17 | 1 | 0 | 0 | 0 |
| 19 | 14 | 3 | 0 | 3 | 1.0 |
| 19 | 15 | 6 | 1 | 3 | 8.8 |
| 19 | 16 | 20 | 3 | 228 | 18.9 |
| 20 | 15 | 9 | 0 | 2 | 0.2 |
| 20 | 16 | 17 | 4 | 105 | 17.9 |
| 21 | 16 | 9 | 0 | 19 | 2.1 |

Legends for Figures

1. Face of form used in regular 1-hour section searches.
2. Results of section searches in southeastern Imperial County, California. Observations of Phrynosoma mcallii are indicated by black dots. Light stippling: no horned lizard scats; diagonal lines: 1-14 horned lizard scats; cross-hatched: 15+ scats.
3. Results of section searches in southern Riverside County and north-central Imperial County, California. Section codes as in Fig. 2.
4. Results of section searches in Riverside County, California. Section codes as in Fig. 2.
5. Results of section searches in northeastern San Diego County and northwestern Imperial County, California. Section codes as in Fig. 2.
6. Results of section searches in southwestern Imperial County, California. Section codes as in Fig. 2.
7. Relative abundance of Phrynosoma mcallii in 65 townships in southeastern California.
8. Present geographic distribution of Phrynosoma mcallii in California (within dashed lines). Dots may indicate general locales and there is no one-to-one correspondence between dots and numbers of individuals collected or observed. Some old records from south-central Imperial County have been omitted.
9. Distribution of Phrynosoma mcallii in San Diego and Imperial Counties, California. Stippled areas are optimal habitats.

DATE ____/____/____ (DD (1-6) MM YY) TIME START ____ (HHMM (8-11)) OBSERVER ____ (AAA (13-15))

QUADRANGLE ____ (17-31)

RANGE ____ (33-35) TOWNSHIP ____ (37-39) SECTION ____ (41-43)

| | TALLIES | TOTAL | | TALLIES | TOTAL |
|---|---|---|---|---|---|
| P. platyrhinos | | | Cnemidophorus | | |
| Callisaurus | | | Urosaurus | | |
| Dipsosaurus | | | Uma | | |
| Uta | | | Crotalus | | |
| Red. Hv. ant nests | | | Blk Hv. ant nests | | |

| | TALLIES | TOTAL |
|---|---|---|
| [illegible]oma m'callii | | |
| Scats | | |

FIGURE 1. Turner et al 1980.

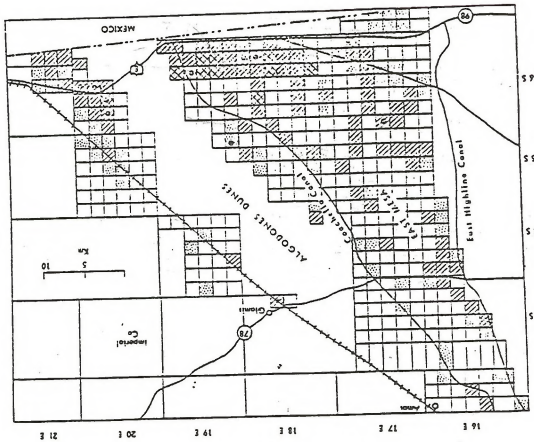


FIGURE 2. Turner et al 1980.

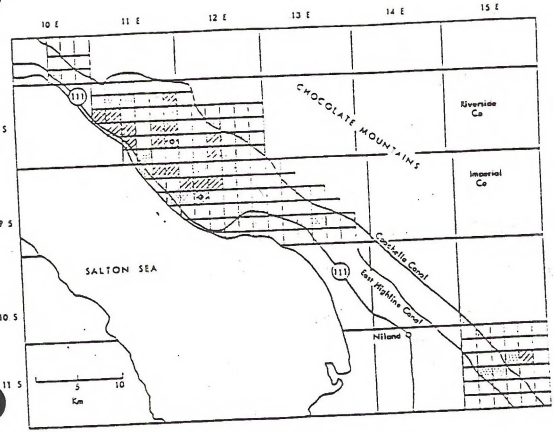


FIGURE 3. Turner et al., 1980

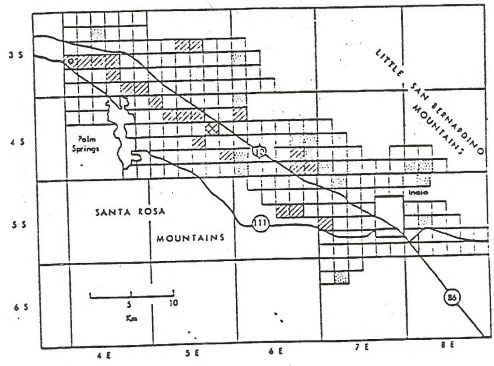


FIGURE 4. Turner et al 1980

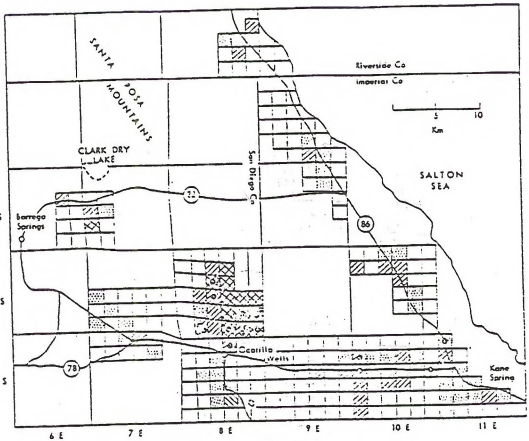


FIGURE 5. Turner et al 1980

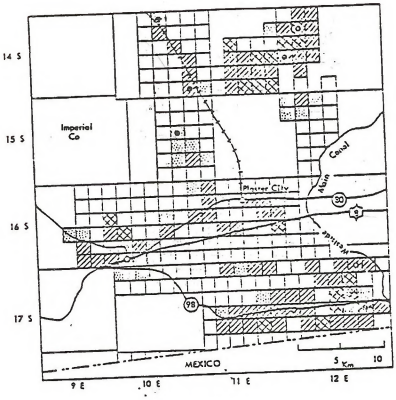


FIGURE 6. Turner et al 1980

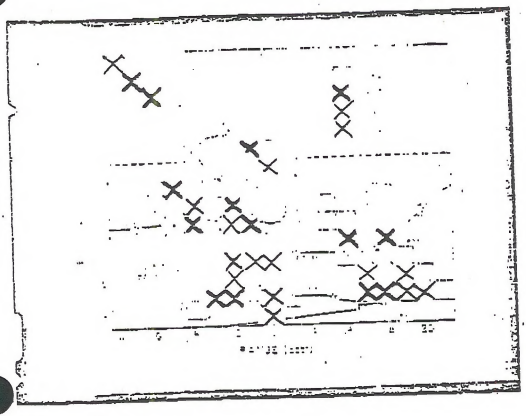

Figure 7. Turner et al. 1980

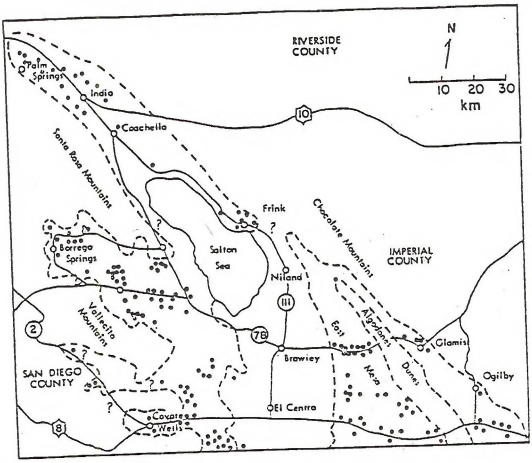


FIGURE 8. Turner et al 1980.

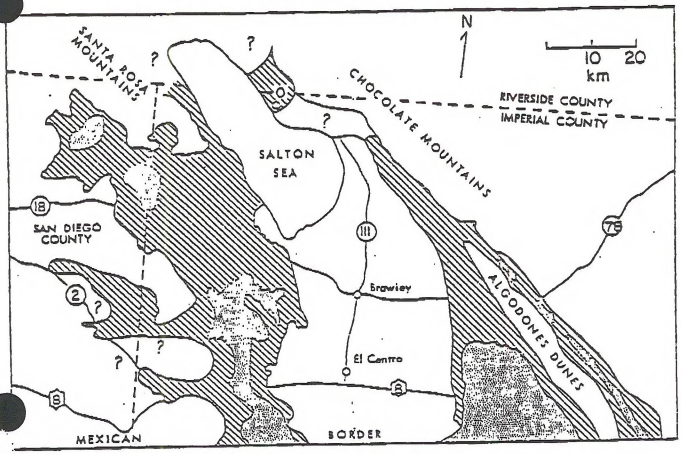


FIGURE 9. Turner et al 1980.

BLM LIBRARY
RS 150A BLDG. 50
DENVER FEDERAL CENTER
P.O. BOX 25047
DENVER, CO 80225